

Amendments to the Drawings

The attached sheets include Figure 7c and changes to Figures 1a, 1b, 2 and 3. The Replacement Sheets shows the replacement Figures 1a, 1b and 2, which have been amended to add the legend “Prior Art,” and the replacement Figure 3, which has been amended to add reference characters 200, 202, 204 and 206, described in the specification. The Replacement Sheets also show Figure 7c, which has been added. This figure is supported by the description at paragraphs [0024] and [0094] and adds no new matter.

REMARKS

Claims 1-9, 12-31, 34 and 35 are pending in this application. To expedite prosecution claim 10 has been canceled, claim 1 has been amended to incorporate the limitations of former claim 10, and claim 31 has been amended to depend from claim 1. Applicants cancel and amend these claims without prejudice to pursuing the originally filed claims in continuing applications.

The specification has been amended to correct informalities noted by the Examiner and to change the title as suggested by the Examiner. The abstract has also been amended.

Figures 1a, 1b and 2 have been amended to add the legend "Prior Art." Figure 3 has been amended to add reference characters 200, 202, 204 and 206, described in the specification. Figure 7c has been added. This figure is supported by the description at paragraphs [0024] and [0094] and adds no new matter.

Objections to the Drawings

Figures 1a, 1b and 2 were objected to as not including a legend such as "Prior Art." Figure 3 was objected for not including reference signs mentioned in the specification. Applicants have amended the figures as described above, and believe the amendments overcome these objections. The drawings were also objected to because the specification describes Figure 7c, which was not included in the drawings. Applicants have submitted this figure with this amendment. Because the figure is supported by the specification, Applicants respectfully request the Examiner accept this figure.

Objections to the Specification

The Examiner reminded Applicants of the proper language and form for an abstract. Applicants believe the previous abstract met the requirements for an abstract, but have amended the abstract to address possible concerns of the Examiner. Applicants believe this amendment obviates the objection, but propose to amend the abstract further if the Examiner has specific further objections.

The Examiner also objected to an informality in the description of Figure 14 in paragraph [0119]. Applicants have amended the specification to correct this. Applicants have also amended the title as suggested by the Examiner.

Applicants believe these amendments obviate the objections to the specification.

35 U.S.C. § 103 Rejections

Claims 1, 2, 6-9, 14-16, 18-20, 22-28, 31 and 34 are rejected as being obvious in view of U.S. Patent No. 7,064,088 to Hyodo et al. (“Hyodo”) and claims 17 and 35 are rejected in view of Hyodo in combination with U.S. Patent No. 7,087,271 to Rhee et al (“Rhee”). Claims 1-16, 19-32 and 34 are rejected as being obvious in view of U.S. Patent Publication No. 2005/0156285 to Gates et al. (“Gates”).

Claims 1 and 29

Applicants maintain their previously discussed arguments that neither Hyodo nor Rhee, alone or in combination, teach or suggest a film that has both low dielectric constant and low stress.

To advance prosecution, however, Applicants have amended claim 1 to incorporate the limitations of former claim 10, which was rejected over Gates. Without addressing the merits this rejection, Applicants believe that the accompanying Rule 131 Declaration effectively removes the Gates reference as prior art. Therefore it is respectfully submitted that claim 1 and its pending dependent claims are patentable over the art on record.

Similarly, Applicants submit that the accompanying Rule 131 Declaration effectively removes the Gates reference as prior art for claim 29, and believe that it and its pending dependent claims are patentable over the art on record.

Claim 19

Prior to Applicants’ invention, low k films ($k < 3.2$), including CDO films, had a stress in excess of 50MPa. The residual stress of CDO films produced under unoptimized process conditions is generally >50 MPa with a typical value in the range between 60MPa and 90MPa. Embodiments of the invention significantly lower residual film stress by appropriate precursor selection and optimizing deposition process conditions.

In Hyodo, insulation films are described as having dielectric constants below 3.0. There is no teaching or suggestion that these films would have low stress. It appears that these films are conventional low-k films having stress above 50 MPa. Hard films in Hyodo are described as having lower stress of about 0 to about 300 MPa, but higher dielectric constants.

In the Office Action, the Examiner states the following:

“Hyodo teaches wherein the dielectric layer [has] a residual compressive stress of about 0 to 300 MPa and wherein the dielectric constant of the carbon doped oxide dielectric layer is less than about 4 (Hyodo, column 4, lines 65-67). Hyodo fails to expressly disclose

wherein the dielectric layer has a compressive stress of less than about 50 MPa and wherein the dielectric constant is not greater than 3.”

The Examiner goes on to contend that a $k < 4$ (as taught in Hyodo) is a range that overlaps Applicants’ claimed limitation of a k no greater than 3. Applicants respectfully submit that 1) if Hyodo teaches a range of k values for hard films, the low end of the range is not 0 as the Examiner appears to suggest, but above 3, and 2) Hyodo does not enable making a hard film having a dielectric constant of less than 3.0.

The k -values that Hyodo discloses achieving for its hard film all have k -values of less than 4, but none are close to Applicants’ claimed limitation of no more than 3. Specifically, Hyodo discloses hard film k -values of 3.5, 3.4, 3.5 and 3.3 in Examples 1-4, respectively. This disclosure in Hyodo does not reasonably teach or enable one of skill to make a film having a dielectric constant of less than 3.0 and a low compressive stress.

This is in part because there is a trade-off in conventional films including those in Hyodo between mechanical properties and dielectric constant. In general, the lower the dielectric constant, the worse the mechanical properties. Similarly, the better the mechanical properties, the higher the dielectric constant. Prior to Applicants’ invention, low dielectric films (> 3.2) having low residual stress had not been achieved. While Hyodo may describe making films having relatively high dielectric constant (3.3 and above) having low compressive stress, it does not teach or suggest the methods of Applicants’ claim, which provide films having both low residual stress and low dielectric constant.

For at least this reason, Applicants submit that the Hyodo does not teach or suggest all the limits of claim 19. Without addressing the merits of the rejection over Gates, Applicants submit that the accompanying Rule 131 Declaration effectively removes the Gates reference as prior art for this claim.

For at least the above reasons, Applicants submit claim 19 and its dependent claims are patentable over the cited art.

Double Patenting

Claims 1, 2, 8-10, 12, 13 and 16-18 have been provisionally rejected on the ground of nonstatutory obviousness-type double patenting over claims 11, 17, 18 and 30 of application No. 10/941,502. Applicants note that this application has now issued as U.S. Patent No. 7,326,444 and are submitting a terminal disclaimer over ’444 patent with this response. As noted in the Action,

a timely filed terminal disclaimer may be used to overcome a rejection based on non-statutory double patenting.

Conclusion

Applicants believe that all pending claims are allowable and respectfully request a Notice of Allowance for this application from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below. If it is determined that any additional fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 504480 (Order No. NOVLP091).

Respectfully submitted,

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